# *Diversity Monitoring in Montana*

2008-2010

Final Report

Lauri Hanauska-Brown, Bryce Maxell, Adam Petersen,

Scott Story

## Executive Summary

In Montana, very little information exists on the status and distribution of a diverse assemblage of nonavian vertebrates, including small mammals, amphibians, terrestrial reptiles and bats. The Montana Inventory and Monitoring Project (Diversity Monitoring) was initiated to: (1) simultaneously provide information on a diverse suite of faunal groups; (2) provide baseline information on species' distributions, site occupancy rates, and detection probabilities that can be used to inform current species conservation status ranking and management efforts; (3) evaluate methodologies and preliminary estimates of site occupancy and detection rates in order to refine survey protocols for future monitoring efforts; (4) establish a baseline of information that can eventually be used to assess changes in distribution and status over time related to changes in habitat and/or management efforts; (5) identify immediate or future research needs for individual species, species assemblages, or habitats; and (6) identify gaps in species' ranges across the state and potentially create maps identifying patterns in individual or collective occupancy rates of species across the state.

During the period 2008 - 2010, 3,863 individual surveys were conducted during 213 days at 3,048 unique locations within 282 quarter-quadrangle sampling areas in Montana. A majority of sampling occurred on private property (51%), with additional sampling occurring on US Forest Service (16%), Bureau of Land Management (13%), State (12%), and other lands (9%).

During structured surveys, 5,806 species detections were recorded, and of those detections, 84 unique species were identified. In addition to structured survey observations, 5,912 species observations were recorded incidentally at 2,634 different locations. We detected 21 Species of Concern in Montana during structured surveys, but failed to detect several others identified as Species of Greatest Conservation Need in Montana's 2005 Comprehensive Fish and Wildlife Conservation Strategy. These included, Great Basin Pocket Mouse, Northern Bog Lemming, Meadow Jumping Mouse, Coeur d'Alene Salamander, Milksnake, Smooth Greensnake, and Western Hog-nosed Snake; all of which may require species specific survey efforts in the future.

The data collected through this work expanded the known range for the following seven species: Dusky or Montane Shrew, Pygmy Shrew, Fringed Myotis, Eastern Red Bat, Pallid Bat, Southern Red-backed Vole, and Montane Vole.

The number of detections and number of different species detected for each survey method varied considerably by geographic location. In general, the number of bat species detected was highest along the length of the Missouri River and lowest in the northern quarter of the State. The number of amphibian and aquatic reptile species detected at lentic sites was highest in east-central Montana. For small mammals, the number of species detected at survey sites was highest in eastern Montana and lowest in southwestern Montana. The greatest number of terrestrial reptile species detections was in south-central and southeast Montana, however, detection rates statewide were low overall.

The number of unique species and number of individuals of each species detected for each sample methodology varied considerably by geographic region. For small mammals, both the number of unique species and the total number of individuals detected in each quarter-quad was highest in southwestern

Montana where Great Basin fauna come into the state, the east front of the Rocky Mountains where plains and mountain fauna's meet, and in some areas of higher topographic relief across eastern Montana where major habitat types converge. Conversely, both the number of unique small mammal species and total numbers of small mammal individuals detected was lowest in areas with the least topographic relief and habitat complexity (e.g., plains of eastern Montana). The number of unique bat species detected by acoustic surveys in each quarter-quad was reasonably high (7 to 9 species) across most of the state, but was low (less than 5 species) in eastern Montana north of the Missouri River where tree and rock outcrop roost sites are very limited on the landscape. The number of unique amphibian and aquatic reptile species detected at lentic sites in each quarter-quad was highest (commonly 6-7 species) across most of eastern and northwest Montana, but relatively low (often less than 4 species) across the northwestern Great Plains and in southwest Montana; landscapes that are relatively dry where habitats have been extensively modified for agriculture. The number of unique terrestrial reptile species detected in each quarter-quad with visual encounter surveys was relatively low (almost always less than 4) across the state and visual encounter surveys failed to detect terrestrial reptiles across most of western Montana.

We estimated detection probability at both a statewide extent and within the boundaries of the known range of the species within Montana and found that detection probabilities varied greatly between species and species groups. As a group, reptiles had the lowest detection probabilities. Estimates of detectability from bat acoustic detectors had relatively tight confidence intervals relative to other groups.

Deer Mouse had the highest estimate of occupancy for small mammal trap line surveys. For bat acoustic surveys, several species had occupancy estimates near 80% within their known range at the quarter-quadrangle scale, including Hoary Bat, Little Brown Myotis, Pallid Bat, and Silver-haired Bat. Fringed Myotis and Townsend's Big-eared Bat had the lowest occupancy estimates within their known range. For amphibians, occupancy estimates within the known range of species were highest for Long-toed and Barred Tiger Salamanders and Woodhouse's Toad, although confidence intervals were large for Long-toed Salamander and Woodhouse's Toad. American Bullfrog and Great Plains Toad had the lowest occupancy estimates within their known range. Occupancy estimates were not obtainable for five of the eleven species encountered during terrestrial reptile surveys due to a lack of repeat detections.

The occupancy and detection analyses suggest the single-season survey methodology presented herein can serve as an effective monitoring tool for most bats, small mammals, reptiles, and amphibians. We found that the methods used were most appropriate for estimating occupancy of these animals when detection probabilities were greater than ten percent. We estimated detection probabilities of less than one percent for many terrestrial reptile species, Ord's Kangaroo Rat, Preble's Shrew, Merriam's Shrew, Eastern Red Bat, Yuma Myotis, and Spotted Bat. The lack of repeat detections for these species or groups of species suggests that alternative or additional sampling methods may be required. However, considering that we detected 29 of 38 small mammal species that were targeted for survey, 14 of 15 bat species, 12 of 17 reptile species, and 12 of 13 amphibian species during this project, we believe the methodologies presented herein provide an adequate framework for broad-spectrum detection of a majority of target species in Montana.

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